

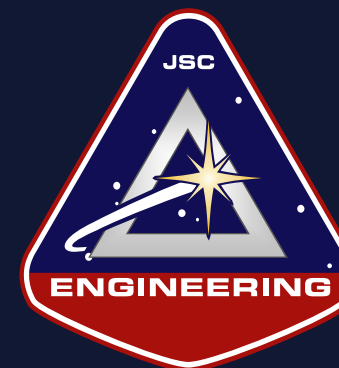


Johnson Space Center Engineering Directorate  
**L-8: Optimizing Virtual Reality and Tracking Systems  
for Zero-G Space Environments**

**Public Release Notice**

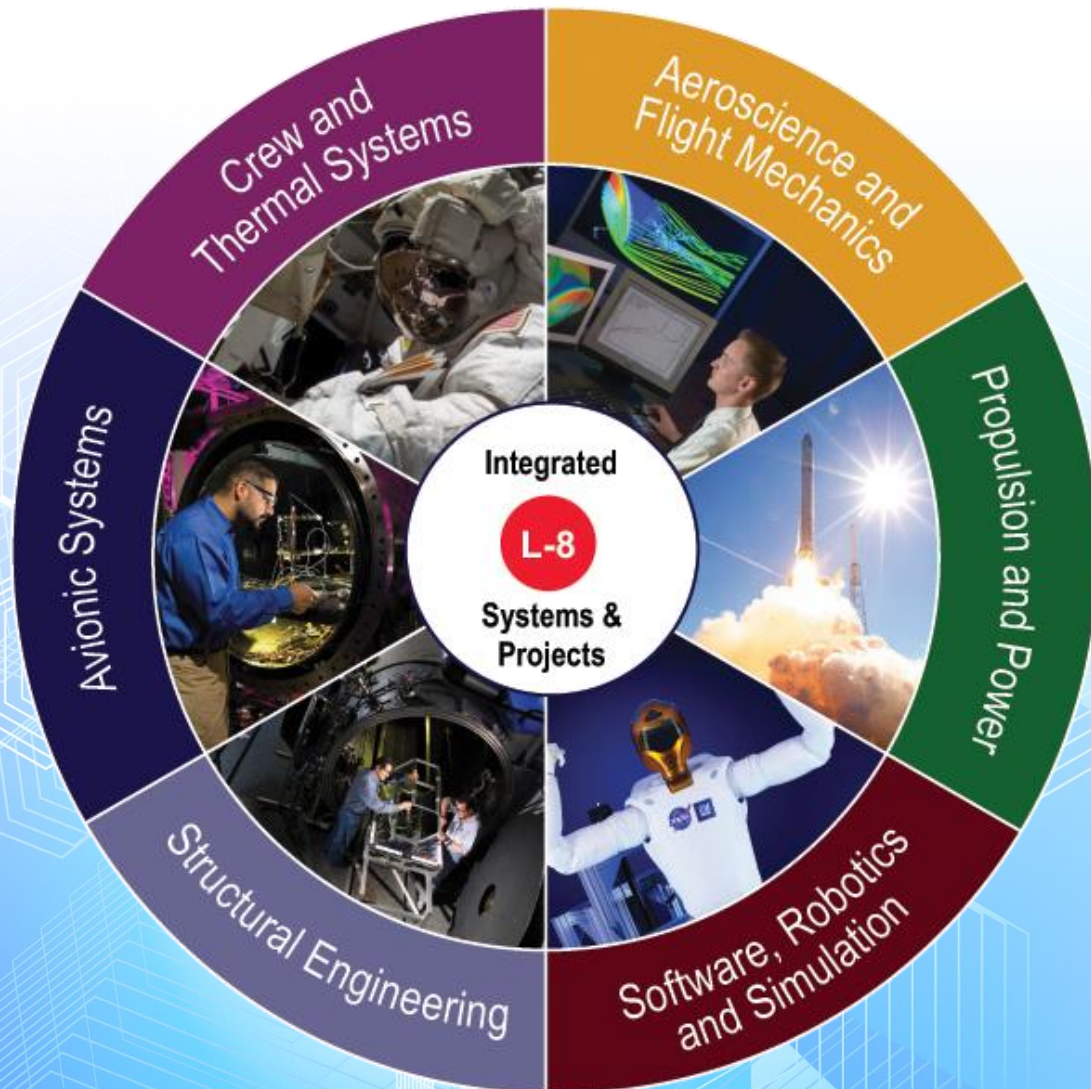
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**Eddie Paddock**  
**November 2016**





# JSC Engineering: HSF Exploration Systems Development



- We are sharpening our focus on Human Space Flight (HSF) Exploration Beyond Low Earth Orbit
- We want to ensure that HSF technologies are ready to take Humans to Mars in the 2030s.
  - Various Roadmaps define the needed technologies
  - We are attempting to define our activities and dependencies
- Our Goal: Get within 8 years of launching humans to Mars (L-8) by 2025
  - Develop and Mature the technologies and systems needed
  - Develop and Mature the personnel needed
- We need collaborators to make it happen, and we think they can benefit by working with us.

# EA Domain Implementation Plan Overview

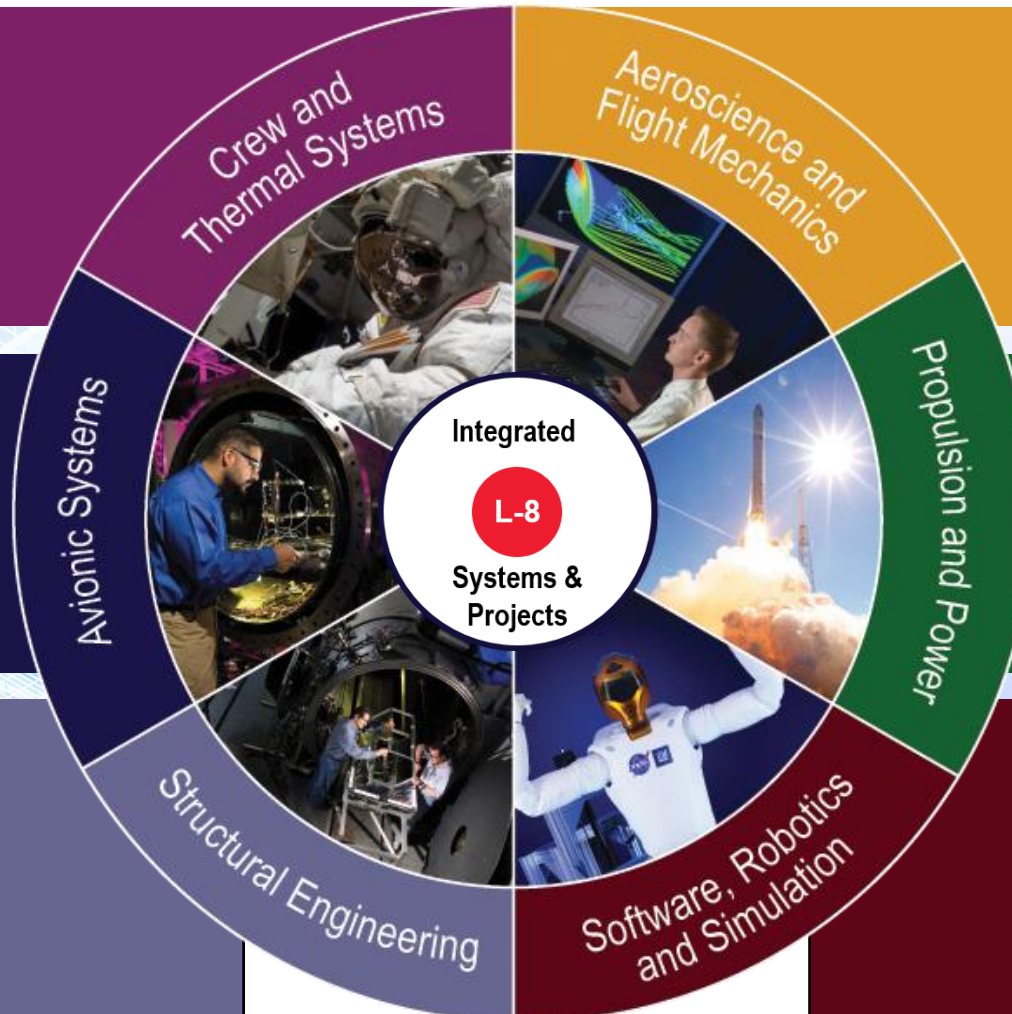
JSC Engineering: HSF Exploration Systems Development



- Life Support
- Active Thermal Control
- EVA
- Habitation Systems

- Human System Interfaces
- Wireless & Communication Systems
- Command & Data Handling
- Radiation & EEE Parts

- Lightweight Habitable Spacecraft
- Entry, Descent, & Landing
- Autonomous Rendezvous & Docking
- Vehicle Environments



- Entry, Descent, & Landing
- Autonomous Rendezvous & Docking
- Deep Space GN&C

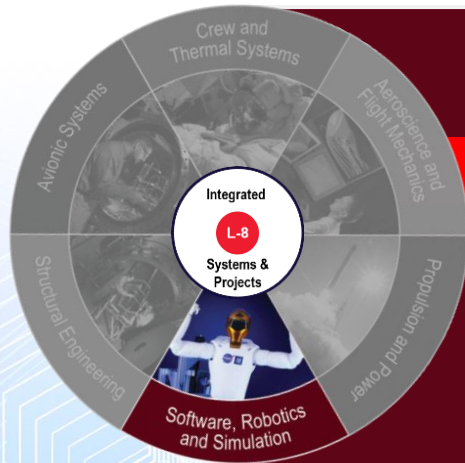
- Reliable Pyrotechnics
- Integrated Propulsion, Power, & ISRU
- Energy Storage & Distribution
- Breakthrough Power & Propulsion

- Crew Exercise
- Simulation
- Autonomy
- Software
- Robotics

AA-2 | iPAS | HESTIA | Morpheus



# Software, Robotics, & Simulation



- Crew Exercise
- Simulation
- Autonomy
- Software
- Robotics

## The Problem

- NASA would like to upgrade its current custom ISS VR training system with a more robust better performing commercial system
- VR integrated tracking system hardware and software need to work in a zero-g environment including rotational and translational tracking with 90Hz HMD graphics sync
- LEDs and laser dependent tracking systems can be problematic for space vehicles
- Current state of the art commercial HMDs with internal tracking systems are HTC Vive and Oculus Rift

## Optimizing Virtual Reality and Tracking Systems for Zero-G Space Environments

- Optimization of commercial VR HMD and tracking systems to support VR training in Zero-0 space environments like ISS and Orion
- Idea is to optimize commercially available HMDs with internal or external tracking system executing on onboard laptops
- This would be a valuable and marketable solution for any micro-g VR training environment
- Looking for technical experts to solve VR system zero-g and real-time tracking (rotation & translation for HMD and avatar body parts) and any related graphics performance issues
- Looking for collaboration with commercial VR HMD (Rift or Vive) and tracking system experts

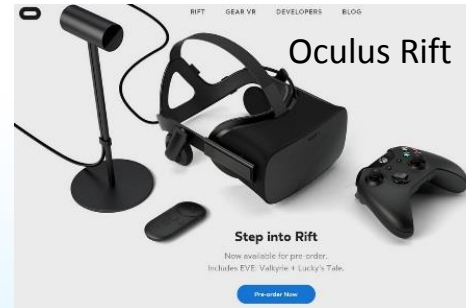


# VR Onboard Training

JSC Engineering: HSF Exploration Systems Development



**SAFER ISS Virtual Reality Trainer**  
(uses mounted camera for rotational tracking)



HTC Vive and Manus VR gloves



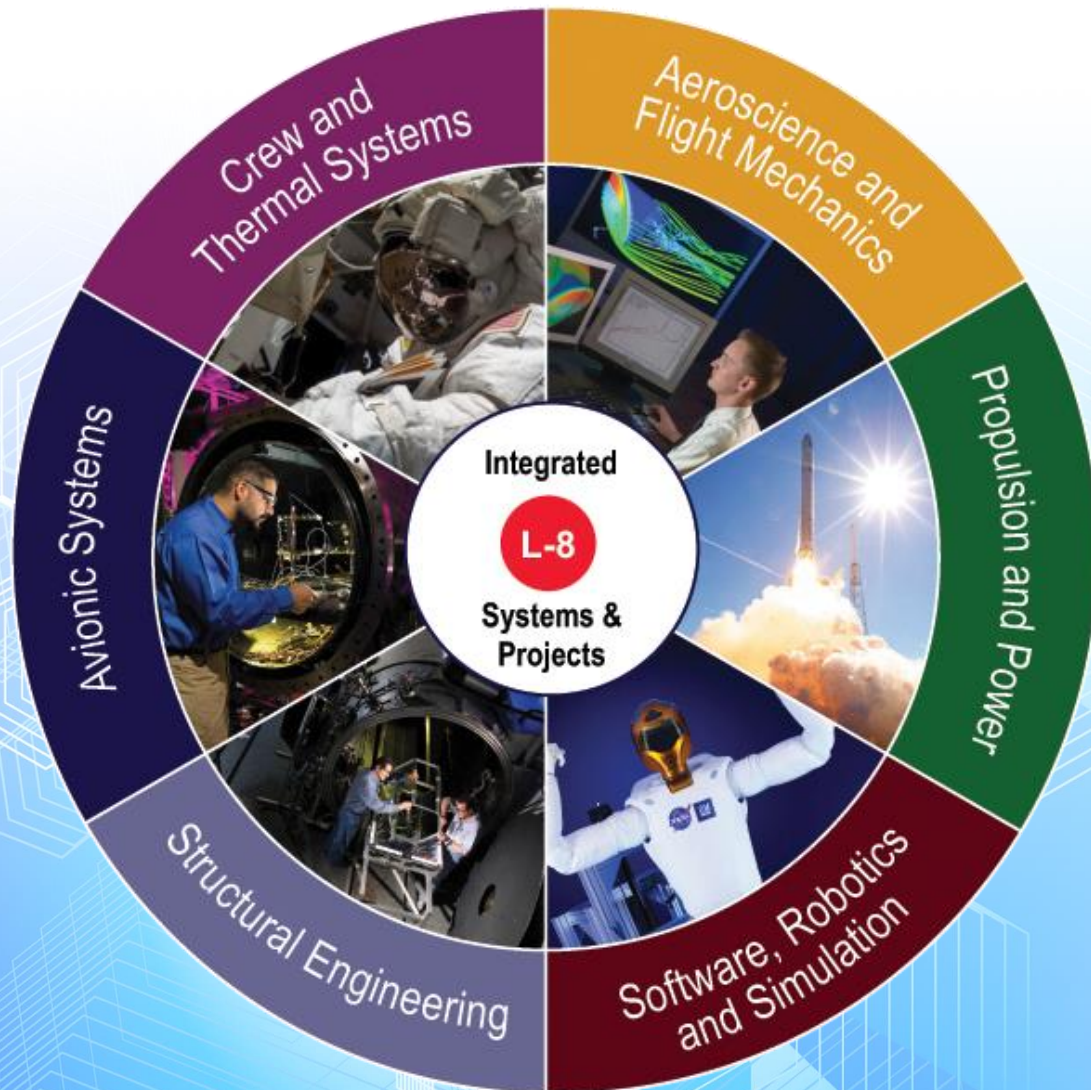
OptiTrack Passive Reflectors



OptiTrack Camera



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  - Pointer to Co-Dev Announcements
  - Pointer to intake site